Syllabus

MSNE 201: INTRODUCTION TO NANOENGINEERING

FALL 2015

Instructor: Prof. Emilie Ringe, office: GRB E200J, email: emilie.ringe@rice.edu

Place & Time: MWF 11:00-11:50, RYON 201

Degree Plan: required for the BS in MSNE

Grade Mode: standard letter

Pre/co-requisite: none

Textbooks: None required. All material will be provided in class.

Class Description: Introduction to the properties of nanomaterials and their applications in engineering, technology, chemistry, energy, biology, and medicine. General discussion of nanotechnology, from multidisciplinary research to consumer products, suitable for all levels and specializations. The emergence of nanotechnology will be used as a case study for how scientists and society react to an emergence of new and unpredicted phenomena. Students will develop the understanding needed to separate the hype from the real in one of the most dynamic and prolific areas of research in the last ten years. Includes lectures, student-lead projects, and lab tours.

Class Format: The class time will consist of lectures with powerpoint slides pre-distributed to students, in-class exercises, guest lectures, and student presentations. Outside of the class, the students will be expected to read scientific literature, complete assignments and quizzes hosted on OWLspace. Students will research a 'nano' topic and present a small (2-4) group poster during a Rice-wide event, and will do a literature review in multidisciplinary groups.

Topics Covered:

- What is nano? How small is nano?
- Nanotechnology timeline
- Scaling laws: how do basic physics concept scale with dimensions?
- Nanotechnology in the literature
- Matter, bonds, forces
- Types of materials: 0D, 1D, 2D. Synthesis, properties, applications.
- Nanocarbon
- Mechanics at the nanoscale
- Optical properties: from stained glass to pregnancy tests

- How do we see nano: characterization tools: probe techniques, electron microscopy
- Consumer products and nano: truth or myth?
- Nano and medicine: from diagnosis to treatment
- Nanobusiness and startups
- Nanotoxicology and public safety

Grading

	%
1st week presentation	2.5
Midterm 1	12.5
Midterm 2	17.5
Characterization--in class (group)	5
News review	12.5
Poster (group)	17.5
OWLspace quizzes (recurring)	15
Literature review (group)	10
Participation	7.5
Total	100

This course is intended to address ABET General Criterion 3. Student Outcomes:
(d) an ability to function on multidisciplinary teams. Teams for the literature review are mandated to be across majors; team effort in the poster session is peer-evaluated.
(g) an ability to communicate effectively. Students are required to present orally their knowledge of nanotechnology in the first week of class; and to present a poster to the campus-wide community.
(j) a knowledge of contemporary issues. Most classes starts with a news section where nanotechnology news are discussed; students are required to prepare their own news review.

Any student with a disability requiring accommodations in this class is encouraged to contact the instructor after class or during office hours. Additionally, students should contact the coordinator for Disabled Student Services in Allen Center.